

STREPTOCOCCAL PNEUMONIAE

Invasive disease or IPD

✓ DISEASE AND EPIDEMIOLOGY

Clinical Description:

Streptococcus pneumoniae (Strep pneumo) is the most common cause of bacterial pneumonia and bacterial meningitis in the U.S. It is also the most common cause of acute otitis media and invasive bacterial infections in children. Strep pneumo is a common cause of sinusitis and conjunctivitis in children. Strep pneumo occasionally causes endocarditis, osteomyelitis, pericarditis, pyogenic arthritis, soft tissue infection, and early-onset neonatal septicemia.

Causative Agent:

Invasive pneumococcal disease (IPD) is caused by the bacterial pathogen *Streptococcus pneumoniae*. They are lancet-shaped, gram-positive diplococci. Of the 90 capsular serotypes that have been identified, 23 serotypes are responsible for most invasive disease in the U.S. Serotypes 4, 6B, 9V, 18C, 19F, and 23F cause most invasive childhood pneumococcal infections in the U.S. Some of these and other serotypes cause most disease in adults. Increasing antibiotic resistance in this organism is an important public health problem.

Differential Diagnosis:

Strep pneumo usually causes pneumonia or meningitis. The differential diagnosis depends upon the age of the patient, but usually includes a rule out of other bacterial and viral causes of these diseases.

Laboratory identification:

Strep pneumo is easily cultured and the capability for culture is widely available in clinical laboratories. Because pneumococci frequently colonize the upper respiratory tract in the absence of the disease, the clinical significance of recovering the organism from non-sterile sites (e.g., expectorated sputum, conjunctiva) is less certain.

Pneumococci resistant to vancomycin have not been described; a strain with a minimum inhibitory concentration of ≥ 2 $\mu\text{g/ml}$ of vancomycin or zone diameter of $< 17\text{mm}$ in a standard disk diffusion susceptibility test using a 30 μg vancomycin disk should be submitted to a reference laboratory for confirmatory testing, and if resistant, should be reported to the UPHL

Strep pneumo can also be diagnosed via antigen detection in CSF or urine and by serology. Because of the ease of laboratory identification and the ability to obtain antibiotic susceptibility data, culture is the preferred method.

UPHL: At this time, UPHL does not have the capacity to serotype these isolates.

Treatment:

Strep pneumo is treated with antibiotics, depending upon the susceptibility profile. Penicillin/amoxicillin, cephalosporins, quinolones, and/or vancomycin are typical treatment regimens depending upon resistance and presentation.

Case fatality:

Approximately 10% of all patients with IPD die of their illness, but case-fatality rates for the elderly and patients with underlying illnesses can exceed 50%, even with antimicrobial therapy.

Reservoir:

Humans are the only known reservoir. Strep pneumo are commonly found in the upper respiratory tract of healthy people worldwide.

Transmission:

Strep pneumo can be spread from person to person by respiratory droplets. While person-to-person transmission of the organisms is common, illness among casual contacts and attendants is rare. Invasive disease arises in colonized individuals related mostly to host factors.

Susceptibility:

Children under the age of 1 and adults over the age of 65 have the highest rates of invasive disease.

Incubation period:

The incubation period varies by type of infection, and it is difficult to establish because most people acquire the organism as colonization of the airway and disease does not result.

Period of communicability:

The infectious period is generally unknown. Because organisms are transmitted but disease does not usually result, isolation of colonized or infected people is not necessary.

Epidemiology:

Strep pneumo causes an estimated 3,000 cases of meningitis; 63,000 cases of bacteremia; 125,000 hospitalizations due to pneumonia; and 6,800,000 cases of acute otitis media each year.

Strep pneumo is ubiquitous, with many healthy people having colonization in their upper respiratory tracts. The pneumococcal serotypes most often responsible for causing infection are those most frequently found in carriers. The spread of the organism within a family or household is influenced by such factors as crowding, season, and the presence of viral upper respiratory infections, including influenza. The incidence of pneumococcal disease is usually associated with increased carriage rates, but high carriage rates do not necessarily increase the risk of disease in households. Pneumococcal infections are most prevalent during winter months; are most common in infants, young children, and the

elderly; and are more common in African-American and some American Indian populations than in other racial and ethnic groups. An increased risk of IPD has been associated with daycare attendance. Outbreaks of pneumococcal pneumonia are rare. When outbreaks occur, they are usually in crowded environments, such as jails and nursing homes. Pneumococcal infections are of increased incidence and severity in people who are immunocompromised due to HIV infection, have functional or anatomical asplenia (especially sickle cell disease), have chronic heart or lung disease, or have other chronic medical conditions.

✓ PUBLIC HEALTH CONTROL MEASURES

Public health responsibility:

- Investigate all suspect cases of disease and fill out and submit appropriate disease investigation forms.
- Determine whether the organism is non-susceptible to antibiotics – define which antibiotics and whether intermediate (I) or resistant (R).
- Provide education to the general public, clinicians, and first responders regarding disease transmission and prevention.
- Identify clusters or outbreaks of this disease.

Prevention:

Vaccine is the only preventive measure.

Chemoprophylaxis:

None.

Vaccine:

PCV7 and PPV23 protect against 90% of invasive disease. Vaccination also decreases the need for antibiotics, therefore preventing antibiotic resistance. Investigation provides an opportunity to identify contacts with indications for pneumococcal vaccine.

PCV7 (Prevnar®) is recommended for:

- Routine immunization of all children 2–23 months of age;
- Children 24–59 months of age with the following high-risk medical conditions:
 - Sickle cell disease;
 - Functional or anatomic asplenia;
 - HIV infection;
 - Immunosuppression caused by illness, treatment or medication; and
 - Certain chronic medical diseases (e.g., cardiopulmonary disease, cochlear implants, CSF fluid leaks, renal failure, nephrotic syndrome, diabetes, liver disease).
- PCV7 should be considered for all children 24–59 months of age, with prioritization given to:

- All children 24–35 months of age;
- All children 36–59 months of age who are African American, Alaskan Native or Native American; and
- All children attending out-of-home childcare (≥ 4 hours per week with ≥ 2 unrelated children).

PPV23 (Pneumovax®) is indicated for the following individuals:*

Immunocompetent Persons	Immunocompromised Persons*
<ul style="list-style-type: none"> • All persons 65 years of age and older • Persons 2–64 years of age with: <ul style="list-style-type: none"> - Cardiovascular disease - Pulmonary disease (excluding asthma) - Diabetes - Alcoholism or chronic liver disease - CSF leaks - Sickle cell disease - Cochlear implants <p>Persons 2–64 years of age:</p> <ul style="list-style-type: none"> • Living in long-term care facilities • Who are Native American 	<p>Persons 2–64 years of age with:</p> <ul style="list-style-type: none"> • Functional or anatomic asplenia • Leukemia, lymphoma, Hodgkin's disease, multiple myeloma, generalized malignancy • Chronic renal failure or nephrotic syndrome • Conditions, such as organ transplants, associated with immunosuppression <ul style="list-style-type: none"> - HIV infection - Immunosuppressive therapy, including long-term corticosteroids (equivalent to ≥ 2 mg/kg/day, or a total of ≥ 20 mg/day of prednisone, for ≥ 14 days) and radiation

* Including children who received PCV7, as long as it has been ≥ 2 months since the last dose of PCV7.

Isolation and quarantine requirements:

Isolation: None

Hospital: Standard body substance precautions.

Quarantine: None

✓ CASE INVESTIGATION

Reporting:

All cases of IPD are reportable. Look for the presence of Strep pneumo in normally sterile sites such as blood, CSF, joint and body fluids, tissues, etc.

Case definition:

In Utah, we collect information on ALL invasive pneumococcal disease, regardless of age and susceptibility data. Out of that pool of information we send data to the CDC in the following two areas:

***Streptococcus pneumoniae*, Drug-Resistant Invasive Disease (2007):**

Clinical Description

Streptococcus pneumoniae causes many clinical syndromes, depending on the site of infection (e.g., acute otitis media, pneumonia, bacteremia, or meningitis).

Laboratory Criteria

- Isolation of *S. pneumoniae* from a normally sterile site (e.g., blood, cerebrospinal fluid, or, less commonly, joint, pleural, or pericardial fluid) and
- "Nonsusceptible" isolate (i.e., intermediate- or high-level resistance of the *S. pneumoniae* isolate to at least one antimicrobial agent currently approved for use in treating pneumococcal infection (12, 13)⁺

⁺Resistance defined by National Committee for Clinical Laboratory Standards (NCCLS)-approved methods and NCCLS-approved interpretive minimum inhibitory concentration (MIC) standards ($\mu\text{g/mL}$) for *S. pneumoniae*. NCCLS recommends that all invasive *S. pneumoniae* isolates found to be "possibly resistant" to beta-lactams (i.e., an oxacillin zone size of less than 20 mm) by oxacillin screening should undergo further susceptibility testing by using a quantitative MIC method acceptable for penicillin, extended-spectrum cephalosporins, and other drugs as clinically indicated (11,12).

Case Classification

Probable: a clinically compatible case caused by laboratory-confirmed culture of *S. pneumoniae* identified as "nonsusceptible" (i.e., an oxacillin zone size of less than 20 mm) when oxacillin screening is the only method of antimicrobial susceptibility testing performed

Confirmed: a clinically compatible case that is laboratory confirmed

***Streptococcus pneumoniae*, Invasive, (Children <5 years) (2007):**

Clinical Description

Streptococcus pneumoniae causes many clinical syndromes, depending on the site of infection (e.g., acute otitis media, pneumonia, bacteremia, or meningitis). Starting in 2000, a conjugate pneumococcal vaccine is recommended for prevention of pneumococcal disease in the pediatric population.

Laboratory Criteria

Isolation of *S. pneumoniae* from a normally sterile site (e.g., blood, cerebrospinal fluid, or, less commonly, joint, pleural, or pericardial fluid)

Case Classification

Confirmed: a clinically compatible case in a child less than five years of age caused by laboratory-confirmed culture of *S. pneumoniae* from a normally sterile site

Case classifications for Drug Resistant *Streptococcus pneumoniae* (DRSP) and Invasive Pneumococcal Disease (IPD) are modified as listed below:

- Isolates causing IPD from children less than five years of age for which antibacterial susceptibilities are available and determined to be DRSP should be reported only as DRSP (event code 11720).
- Isolates causing IPD from children less than five years of age which are susceptible, or for which susceptibilities are not available should be reported ONLY as IPD in children less than five years of age (event code 11717).

Case Investigation Process:

- Fill out a morbidity form and investigation form
- If the patient is less than five years of age –
 - Obtain vaccination status along with the date of the LAST vaccine.
 - If the patient is in daycare – contact the facility and encourage full vaccination of all other children in the facility.
 - If the case is less than five years old and has received at least one dose of PCV7, it is very important to collect the following information:
 - a. Contact the provider and ask whether the patient has been evaluated for an immune disorder, has had his/her spleen or splenic function evaluated, or has had any other testing to evaluate immunologic function.
 - b. Be sure to obtain a complete pneumococcal immunization history (e.g., PCV7 and PPV23, and other vaccine given the same day as the last dose of pneumococcal vaccine).
 - c. Ask if a *Vaccine Adverse Events Reporting System (VAERS) Form* was completed. If not, recommend that it be done now. VAERS forms can either be downloaded or can be completed electronically at the VAERS website at www.vaers.hhs.gov.
 - d. If you have made several attempts to obtain case information but have been unsuccessful (e.g., the case or health care provider does not return your calls or respond to a letter, or the case refuses to divulge information or is too ill to be interviewed), please fill out the form with as much

information as you have gathered. Please note on the form the reason(s) why it could not be filled out completely.

Outbreaks:

An outbreak will be defined as a monthly rate of IPD that is more than 2 standard deviations higher than the average monthly rate of IPD (from 2005 onward).

Identification of case contacts:

Investigate to determine if any close contacts are under the age of 2. Close contacts would include household members, other children at daycare, etc. where close respiratory contact has occurred.

Case contact management:

All close contacts under the age of 2 should be fully immunized with Prevnar. If patients are unimmunized or underimmunized, then the parents should be urged to immunize or catch up on the immunizations for this disease.

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